

Serial Number 09/553,107 filed April 20, 2000
Amendment dated May 22, 2003
Reply to Final Office Action dated April 22, 2003
Attorney Docket No. GJH-0018 (P1998J107D)

LISTING OF CLAIMS:

1. (Currently and previously amended.) A multi stage process for reducing the level of sulfur and in a distillate feedstock having a sulfur content greater than about 3,000 wppm, which process consists essentially of:

- C1
- a) reacting said feedstream in a first hydrodesulfurization stage in the presence of a hydrogen-containing treat gas, a portion of which is cascaded from the second hydrodesulfurization stage of d) below, said first hydrodesulfurization stage containing one or more reaction zones, each reaction zone operated at hydrodesulfurizing condition and in the presence of a hydrodesulfurization catalyst, thereby resulting in a liquid product stream having a sulfur content less than about ~~1,000~~ 500 wppm;
 - b) passing the liquid product stream to a separation zone wherein a hydrogen-containing product gas stream and a liquid phase product stream are produced;
 - c) passing the liquid phase stream to a second hydrodesulfurization stage;
 - d) reacting said liquid phase product stream in said second hydrodesulfurization stage in the presence of a hydrogen-containing treat gas, wherein the rate of introduction of the hydrogen portion of the treat gas in this second stage is less than or equal to 3 times the chemical hydrogen consumption in this second reaction stage, said second hydrodesulfurization stage containing one or more reaction zones operated

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at hydrodesulfurization conditions wherein each reaction zone contains a bed of hydrotreating catalyst, thereby resulting in a liquid product stream having less than about 100 wppm sulfur; and

- e) passing the liquid product stream of step d) above to a second separation zone wherein a hydrogen-containing product gas stream and a liquid phase product stream are produced.

2. (Original) The process of claim 1 wherein step d) is performed so that the liquid product stream contains less than about 50 wppm sulfur.
3. (Original) The process of claim 1 wherein step d) is performed so that the liquid product stream contains less than about 25 wppm sulfur.
4. (Original) The process of claim 1 wherein the catalyst of said first and second hydrodesulfurization stages are selected from catalysts comprised of at least one Group VI and at least one Group VIII metal on an inorganic refractory support.
5. (Previously amended.) The process of claim 4 wherein the Group VI metal is selected from Mo and W and the Group VIII metal is selected from Ni and Co.
6. (Original) The process of claim 1 wherein at least a portion of the hydrogen-containing product gas stream from said first separation stage is recycled to said first hydrodesulfurization stage.
7. (Original) The process of claim 1 wherein all of the hydrogen-containing product gas stream from said second separation stage is cascaded to said first hydrodesulfurization stage.
8. Canceled.

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9. (Original) The process of claim 8 wherein the rate of introduction of hydrogen contained in the treat gas in said second hydrodesulfurization stage is less than or equal to 2 times the chemical hydrogen consumption in said second hydrodesulfurization stage.

10. (Original) The process of claim 1 wherein said second hydrodesulfurization stage contains two or more reaction zones operated at different temperatures wherein at least one of said reaction zones is operated at least about 25°C lower in temperature than the other reaction zone or zones.

CI 11. (Original) The process of claim 10 wherein said second hydrodesulfurization stage contains two or more different reaction zones wherein at least one of said reaction zones is operated at least about 50°C lower in temperature than the other reaction zone or zones.

12. (Original) The process of claim 10 wherein the last downstream reaction zone with respect to the flow of feedstock is the lower temperature reaction zone.

13. (Original) A distillate fuel product produced by the process of claim 1.

14. (Original) The product of claim 13, wherein the product contains less than about 100 wppm sulfur, has a T10 point greater than 205 °C, and having a sulfur level of less than about 100 wppm, a total aromatics content of about 15 to 35 wt.%, a polynuclear aromatics content of less than about 3 wt.%, and wherein the ratio of total aromatics to polynuclear aromatics is greater than about 11.

15. (Original) The product of claim 14 wherein the aromatics to PNA ratio is at least about 15.

16. (Previously amended.) The process of claim 1 wherein a portion of the hydrogen-containing product gas stream from the second separation zone is conducted away from the process.

17. Canceled.

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18. (Original) The process of claim 1 wherein the hydrogen-containing treat gas provided to the second hydrodesulfurization stage is a once-through treat gas.

C1 19. (Original) The process of claim 1 further comprising combining at least a portion of the liquid phase stream of step (e) with at least one of (i) one or more lubricity aid, (ii) one or more viscosity modifier, (iii) one or more antioxidant, (iv) one or more cetane improver, (v) one or more dispersant, (vi) one or more cold flow improver, (vii) one or more metals deactivator, (viii) one or more corrosion inhibitor, (ix) one or more detergent, and (x) one or more distillate or upgraded distillate.
